

HEC-RAS Subgrid Bathymetry

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Objective

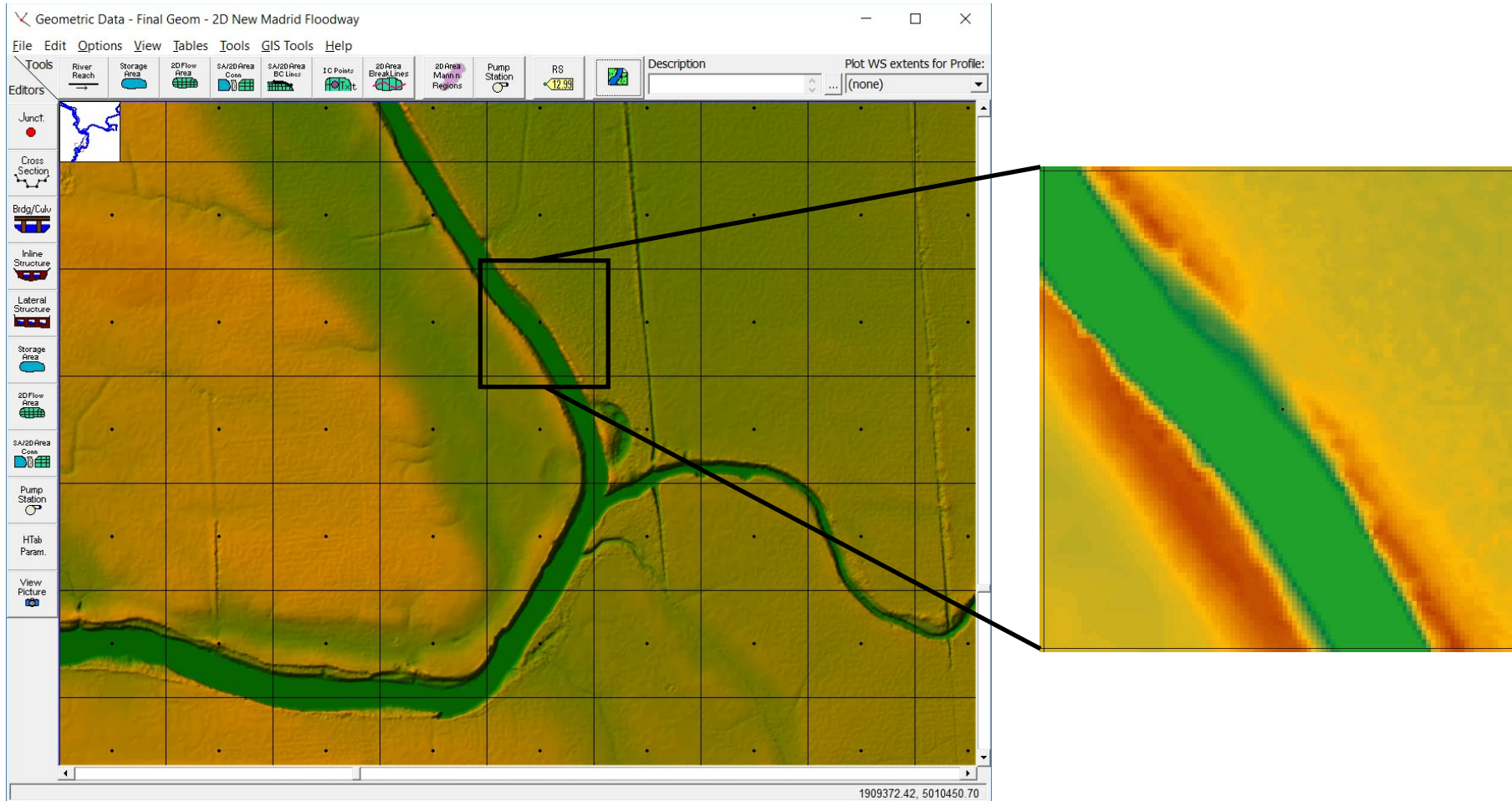
- Overview of the Subgrid Technology in HEC-RAS.



Cell and Face Pre-Processing

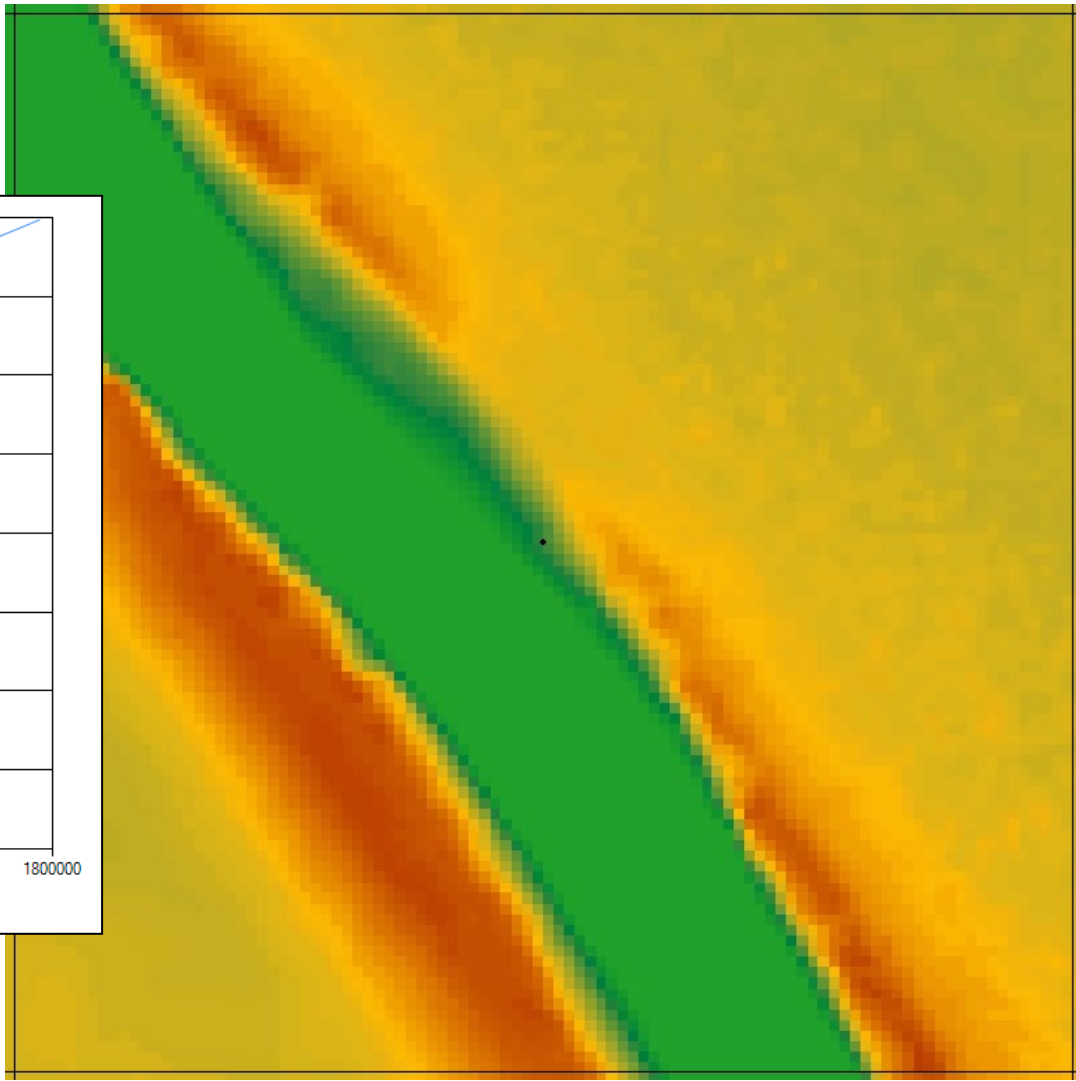
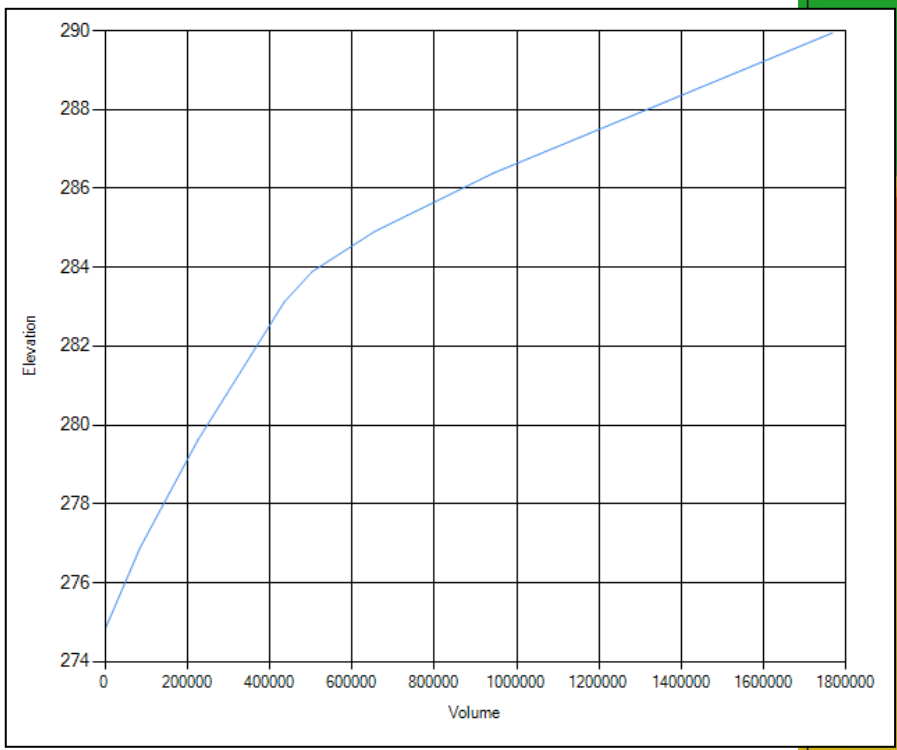
- Detailed elevation-volume relationship for each cell.
- Each **face** of a computational cell is pre-processed into hydraulic property tables (elevation versus, wetted perimeter, area, roughness, etc...).
- Computational cells can be partially wet.
- **Larger computational cells**, without losing details of the underlying terrain.
- Larger cells means **less computations**, which means much **faster** run times.
- HEC-RAS will produce more detailed results for a given cell size than other models that use a single elevation for each cell and face.

Computational Mesh with Detailed Sub-grid Terrain Data



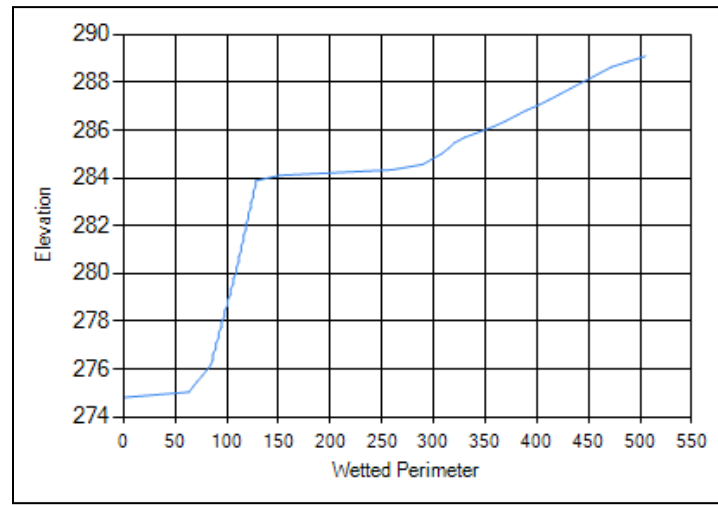
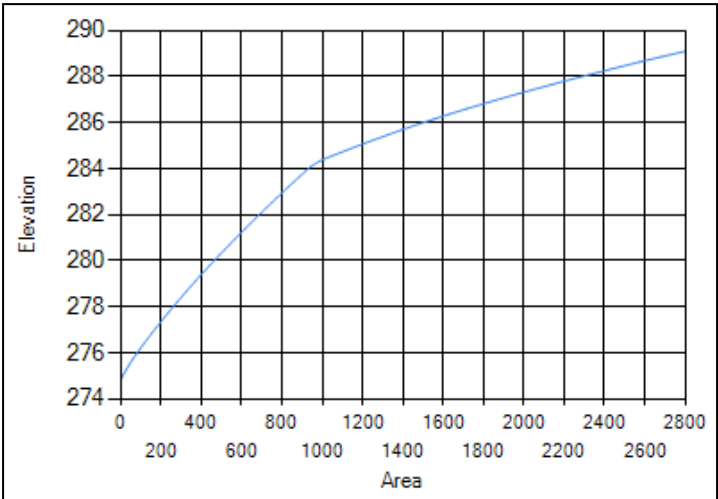
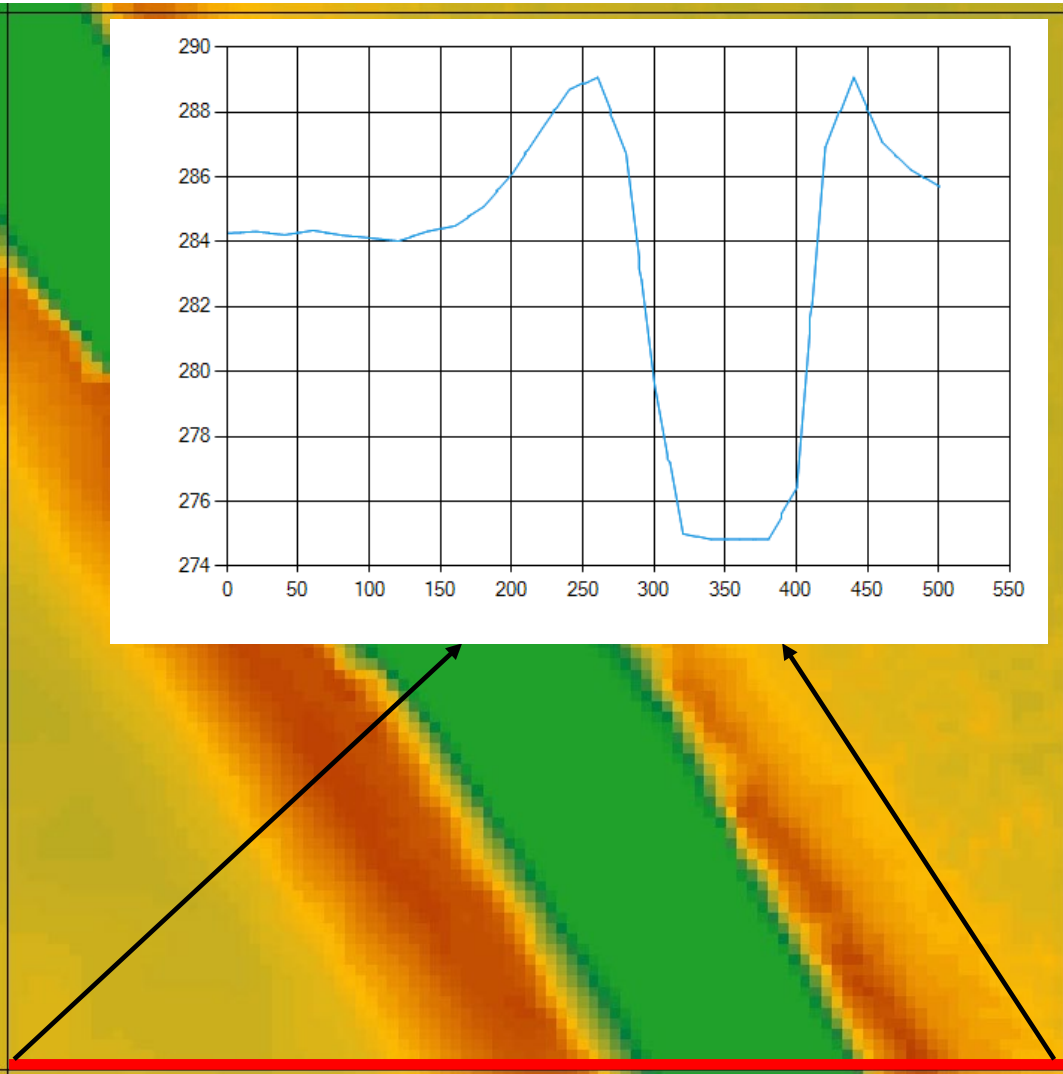


Computational Cells are Pre-Processed Elevation vs. Volume



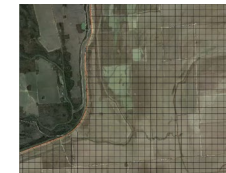
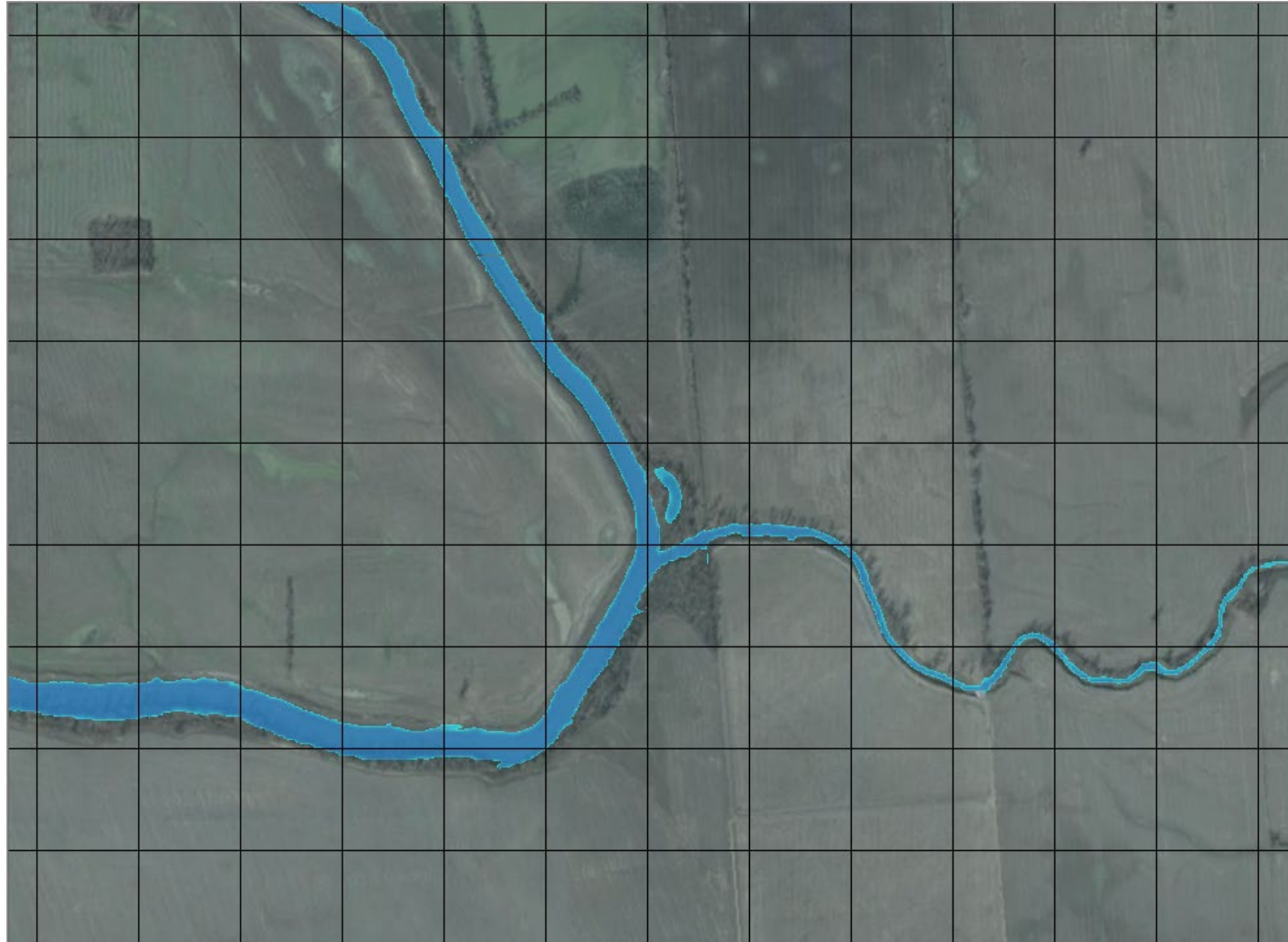


Computational Faces are Pre-Processed Elevation vs. Area, Wetted Perimeter, and n





Benefits of using the detailed sub-terrain for the cell and face hydraulic properties





Example Application – EU Test 5

- Extremely Rapidly rising hydrograph of a dry bed. From 0.0 to 3000 cms in 5 minutes.
- Compare results at multiple locations for three grid resolutions (25, 50, and 100m)
- Compare Computational times



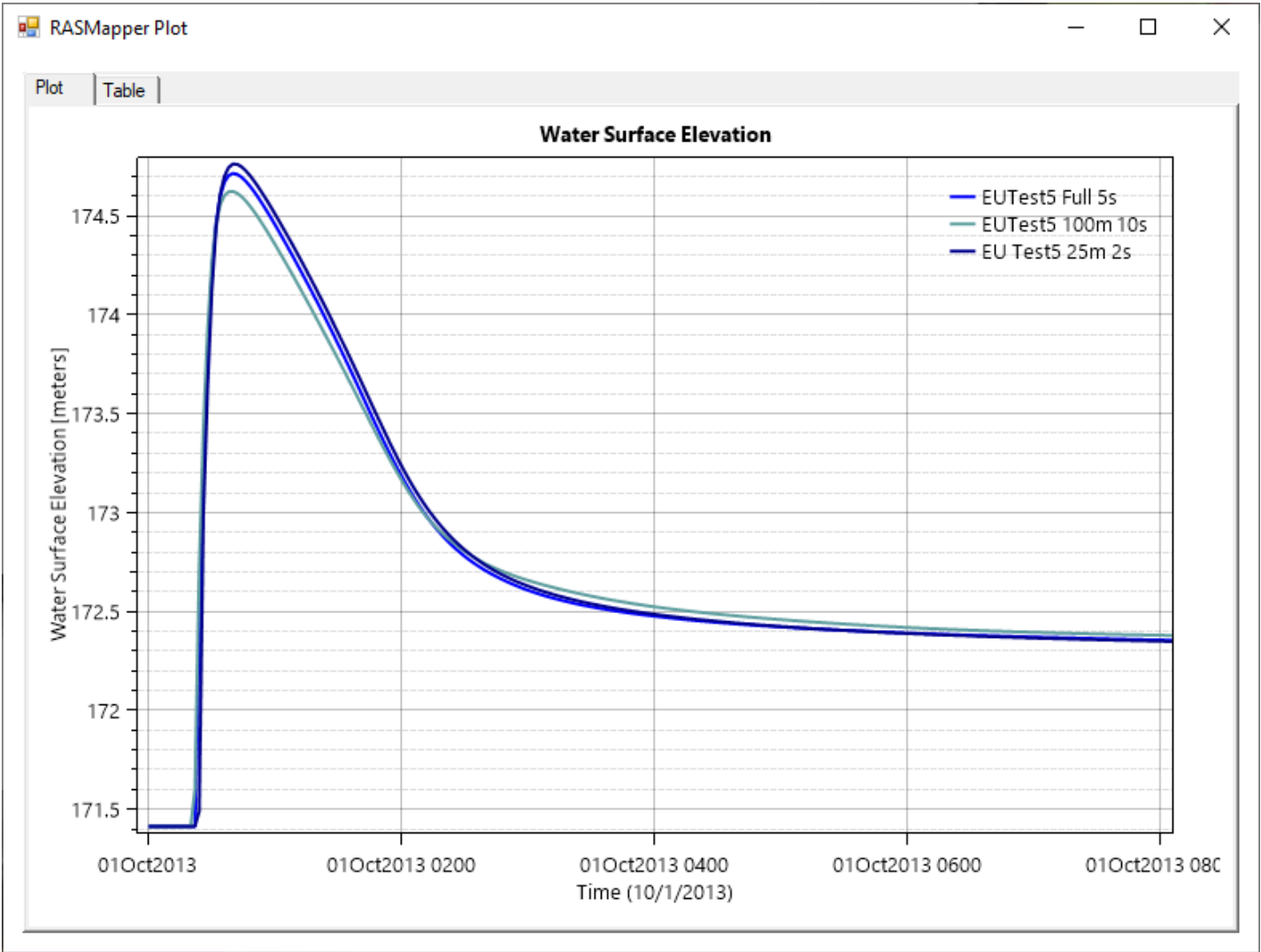


EU Test 5 – Animation



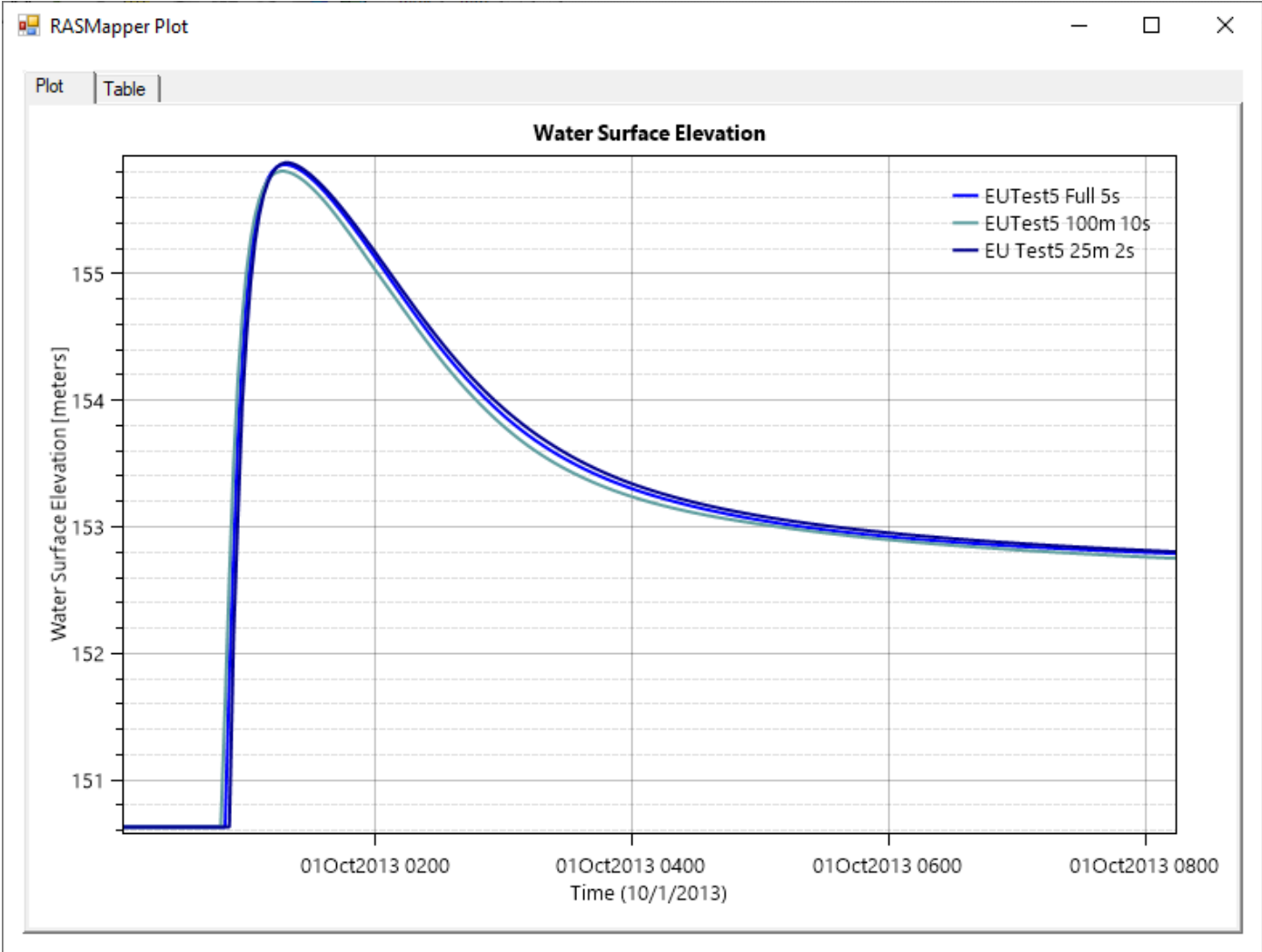


EU Test 5 – Location 1



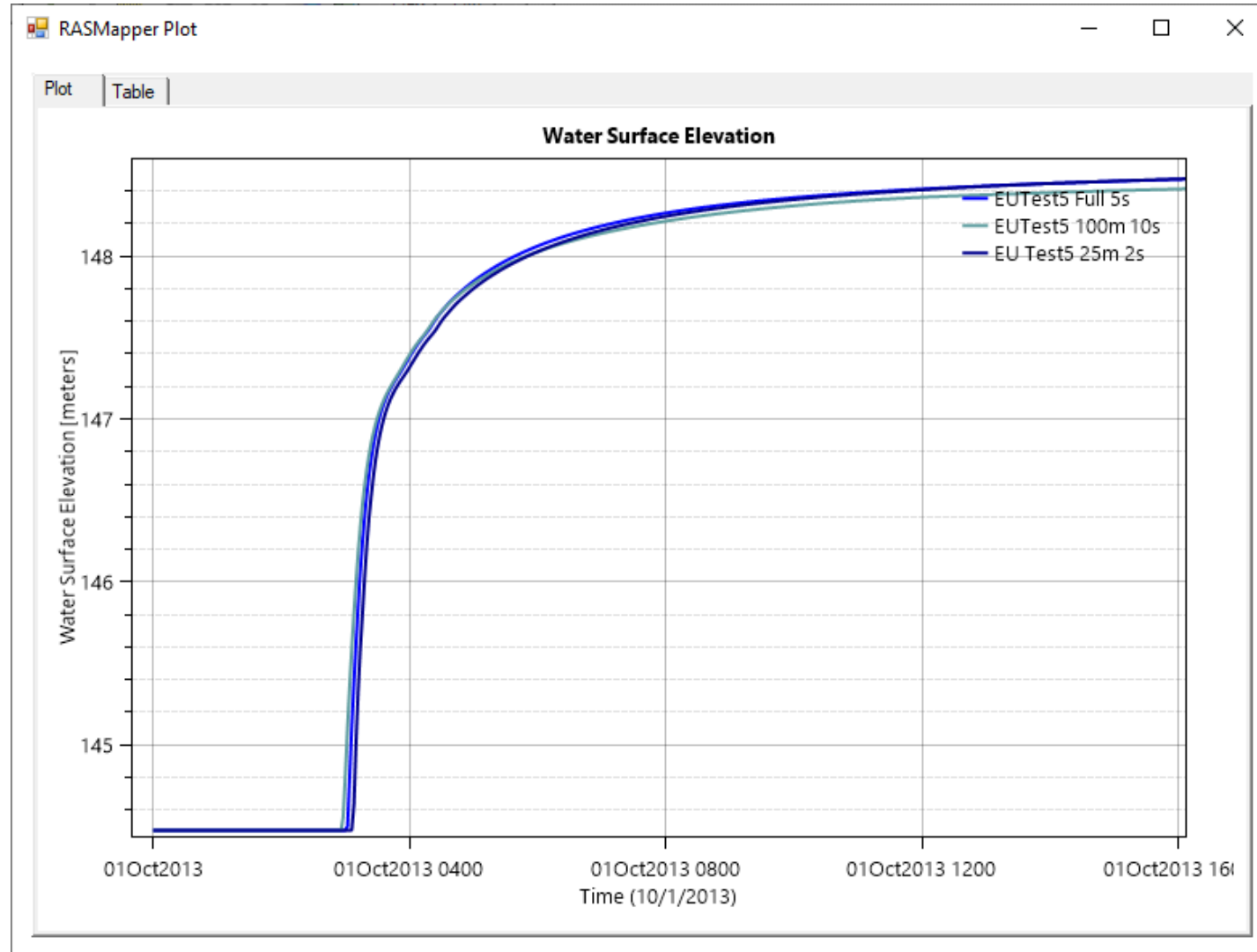


EU Test 5 – Location 3





EU Test 5 – Location 5



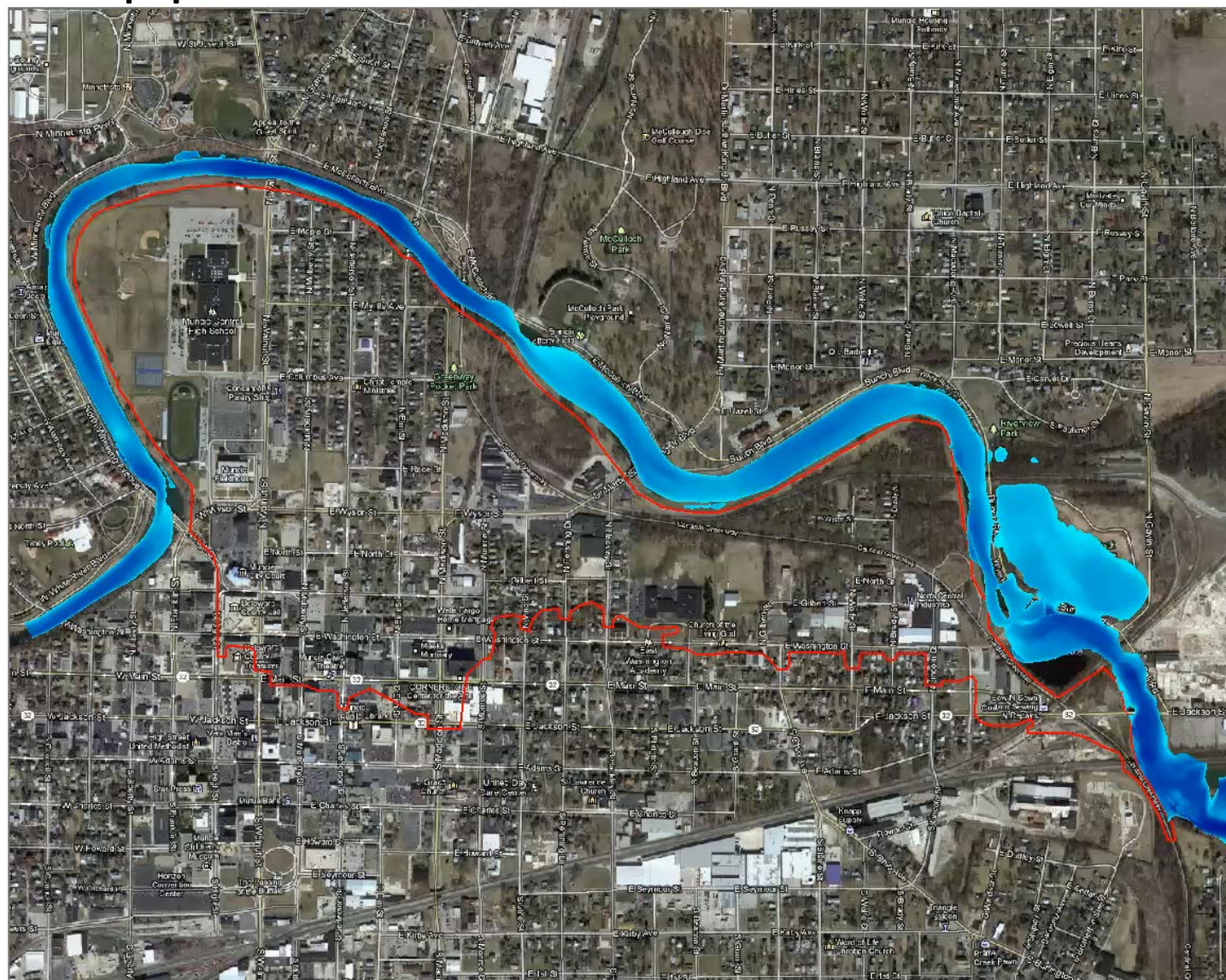


EU Test 5 – Computational Time

Test No	Grid Size	No. Cells	Time Step	RAS Full Saint Venant
1	25m	30340	2 sec	7 min 34s
2	50m	7460	5 sec	1 min 38s
3	100m	1809	10 sec	13s

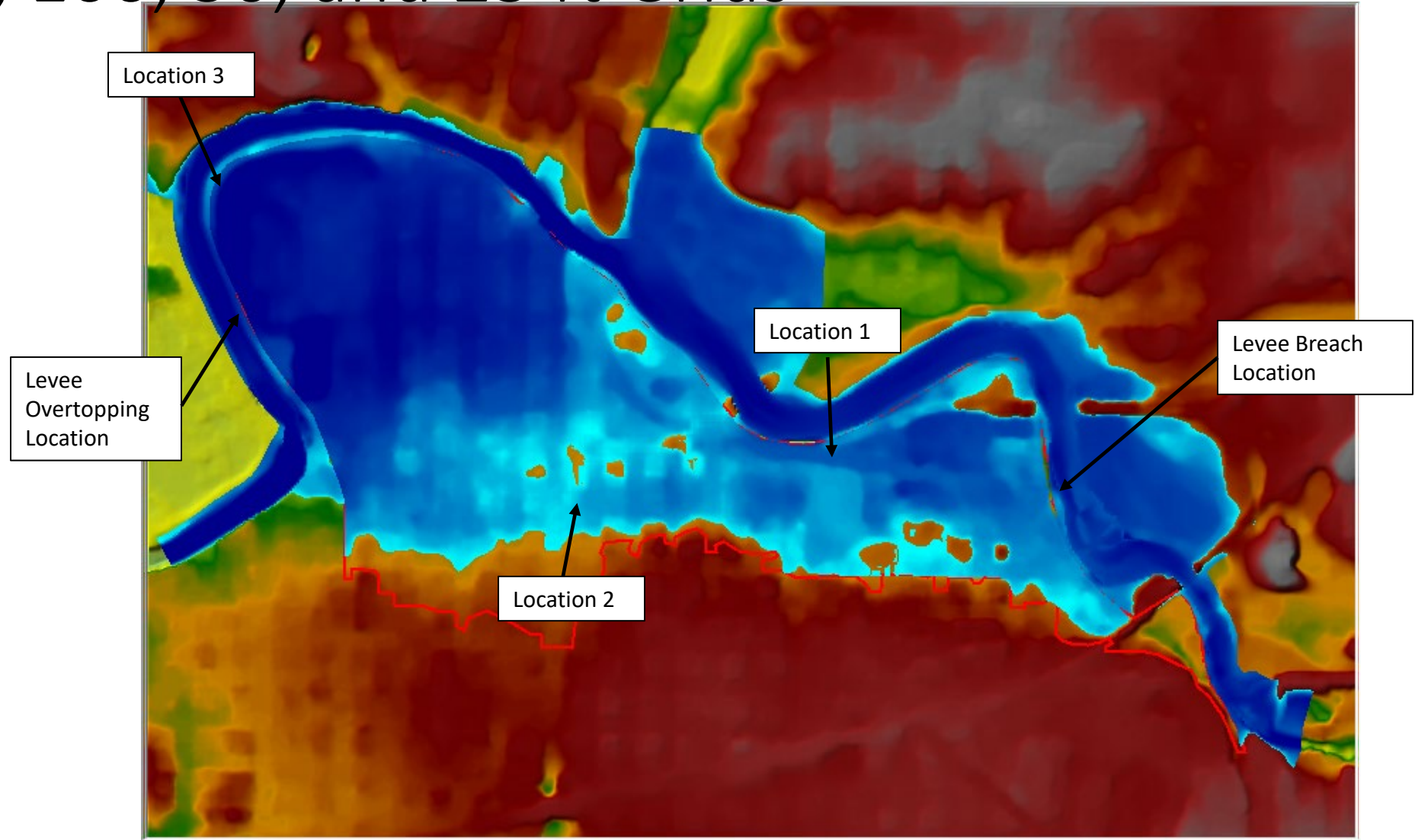


Example Application - Muncie Indiana



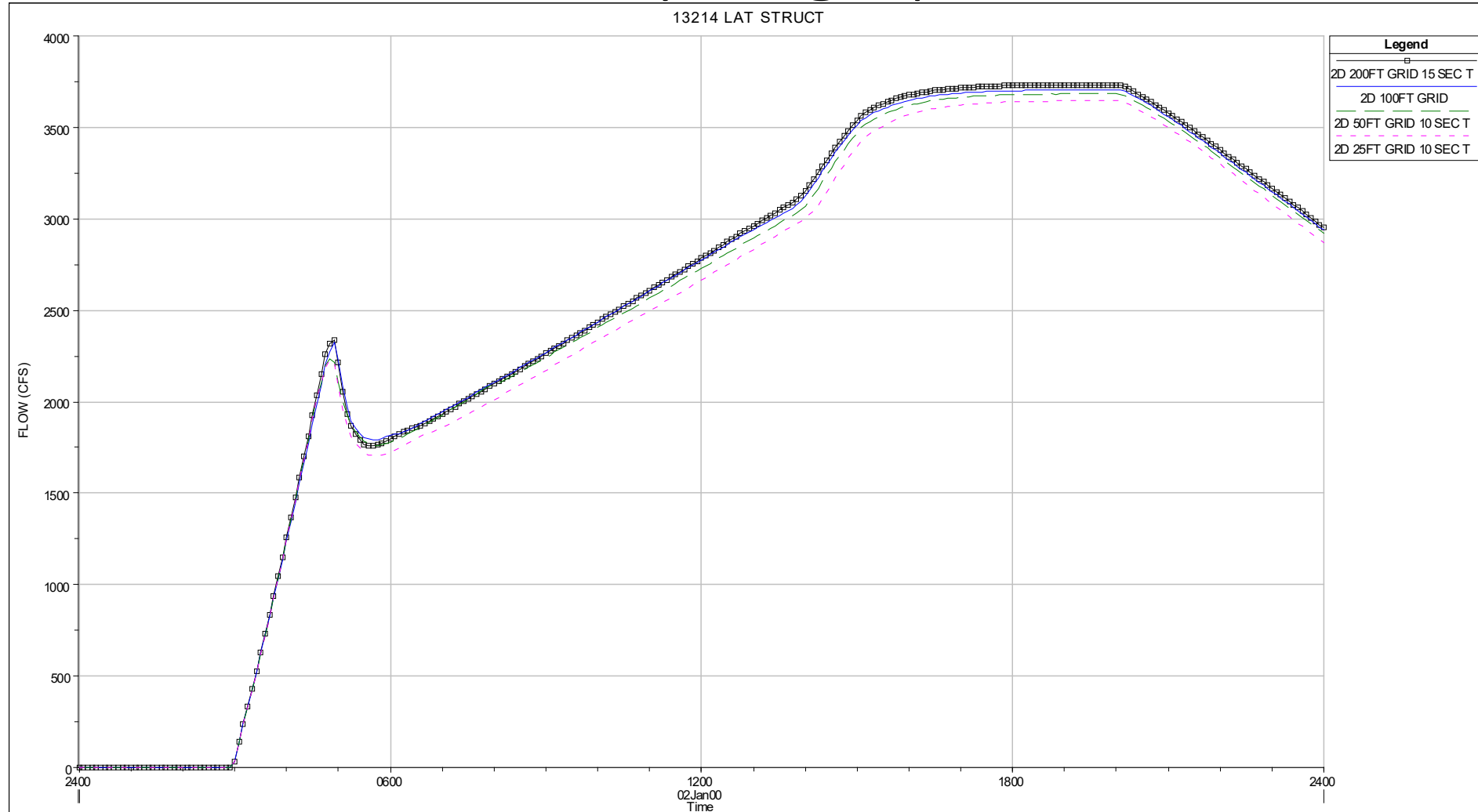


Muncie Indiana – Grid Resolution Evaluation 200, 100, 50, and 25 ft Grids



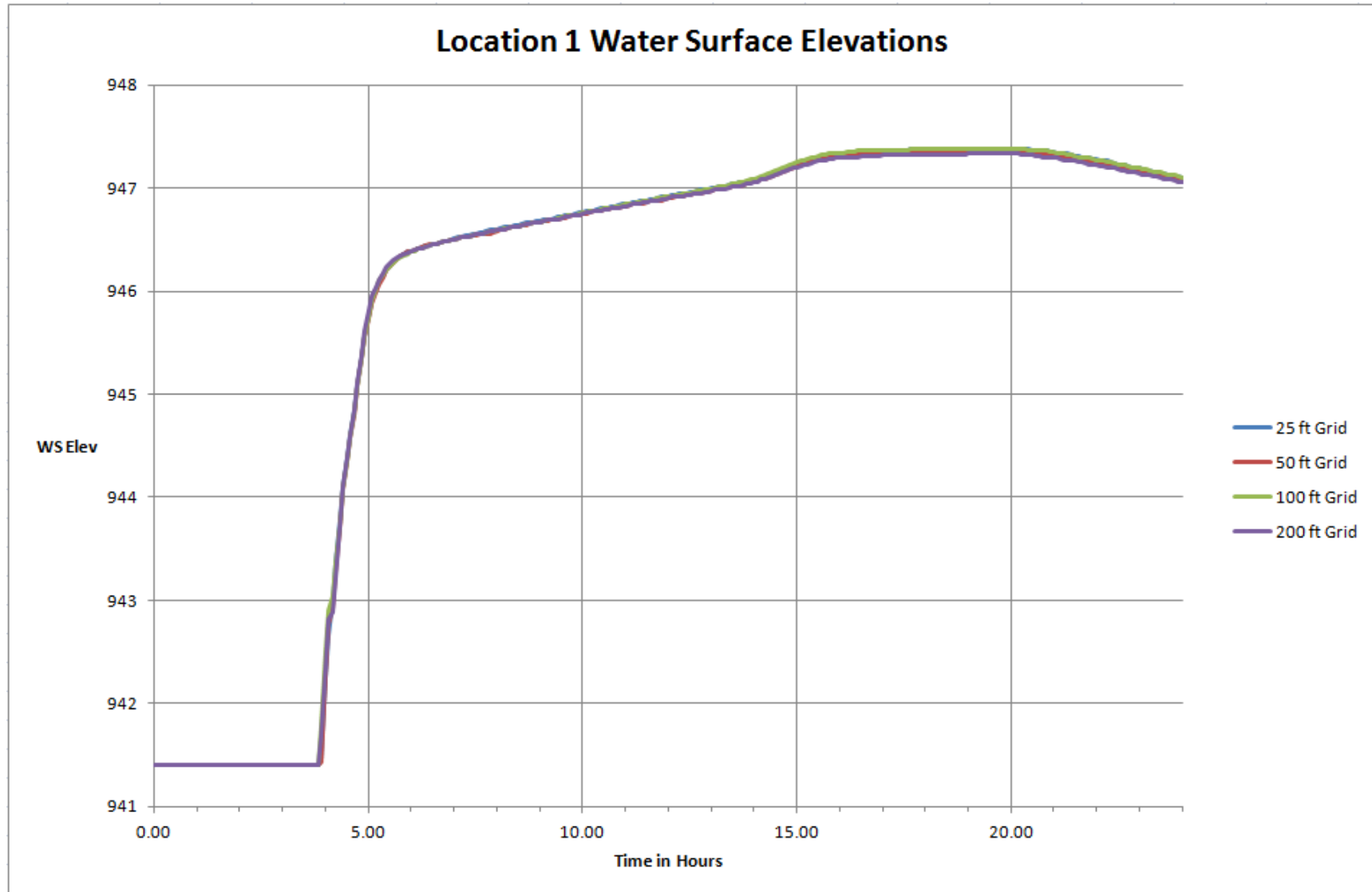


Muncie Breach Flow Hydrographs



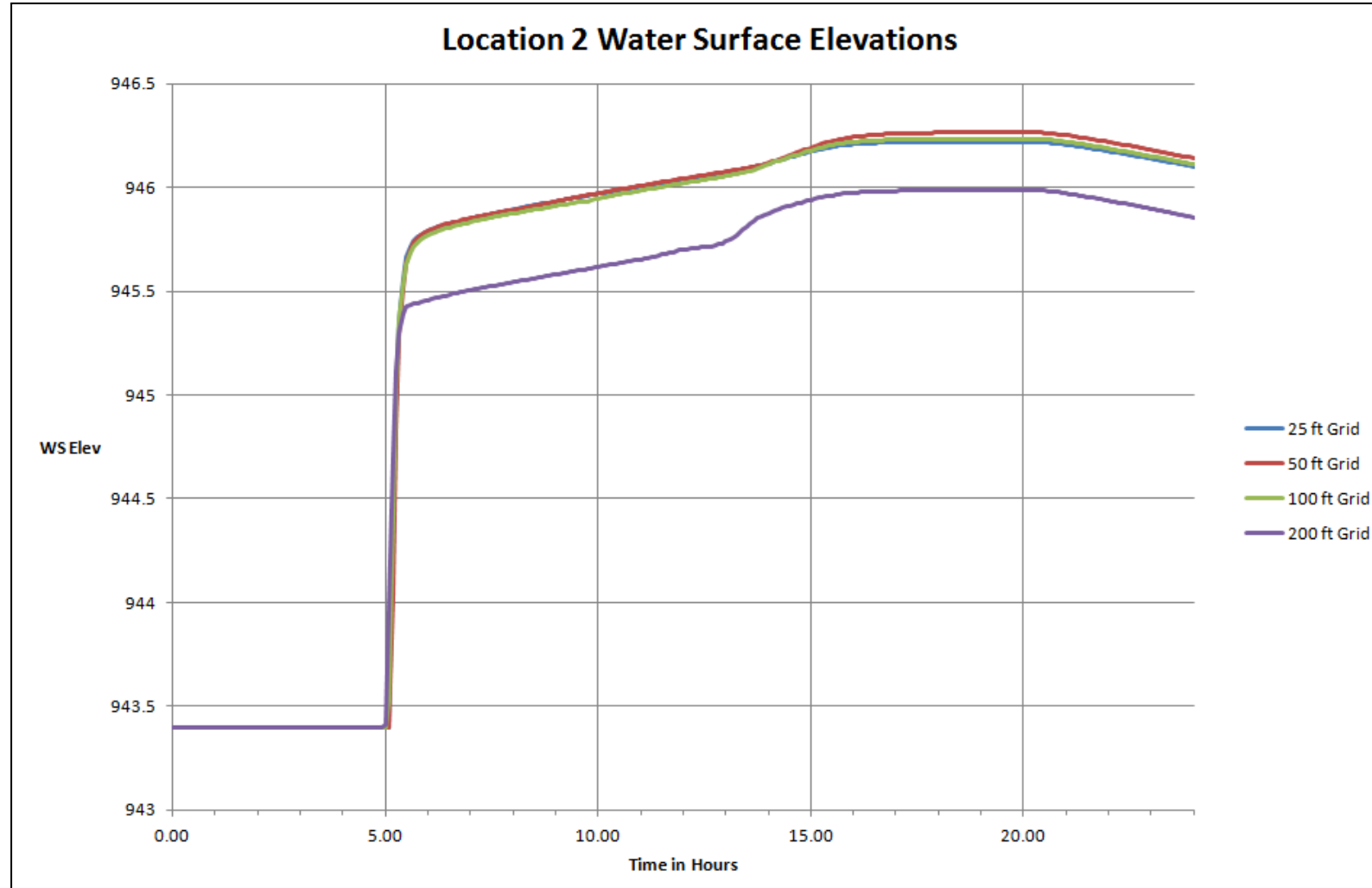


Muncie Indiana - Location 1



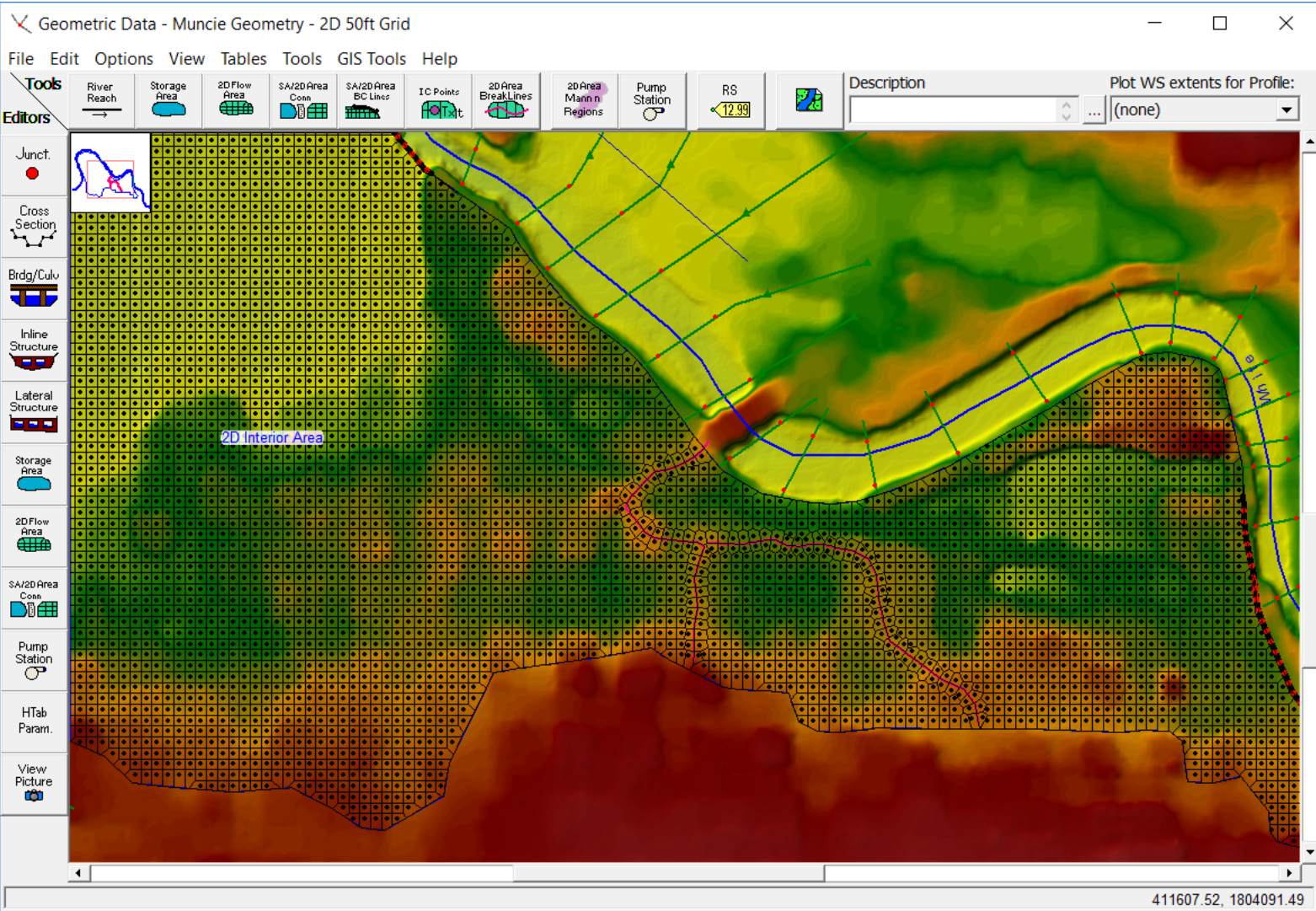


Muncie Indiana – Location 2



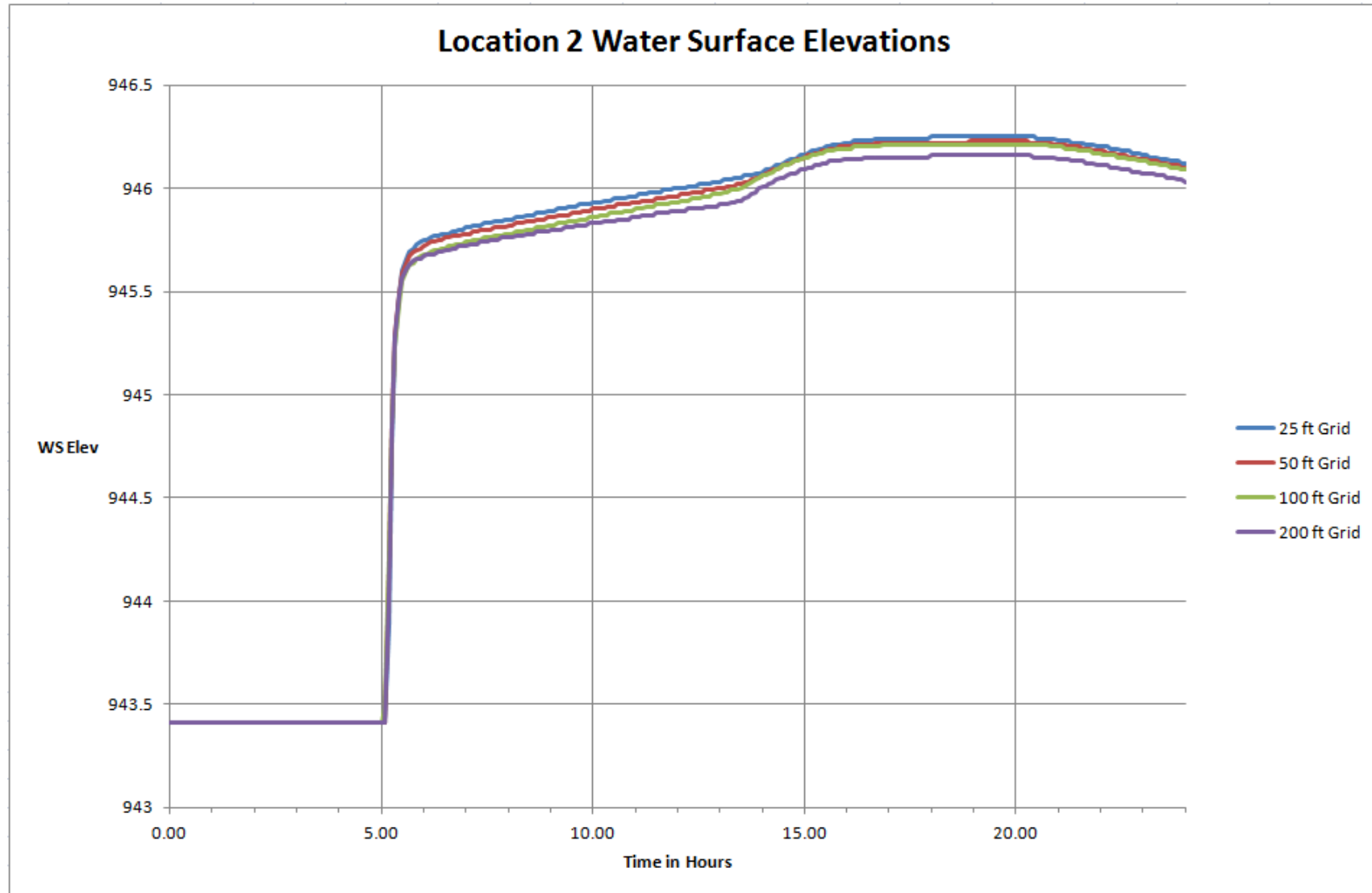


Breaklines Added



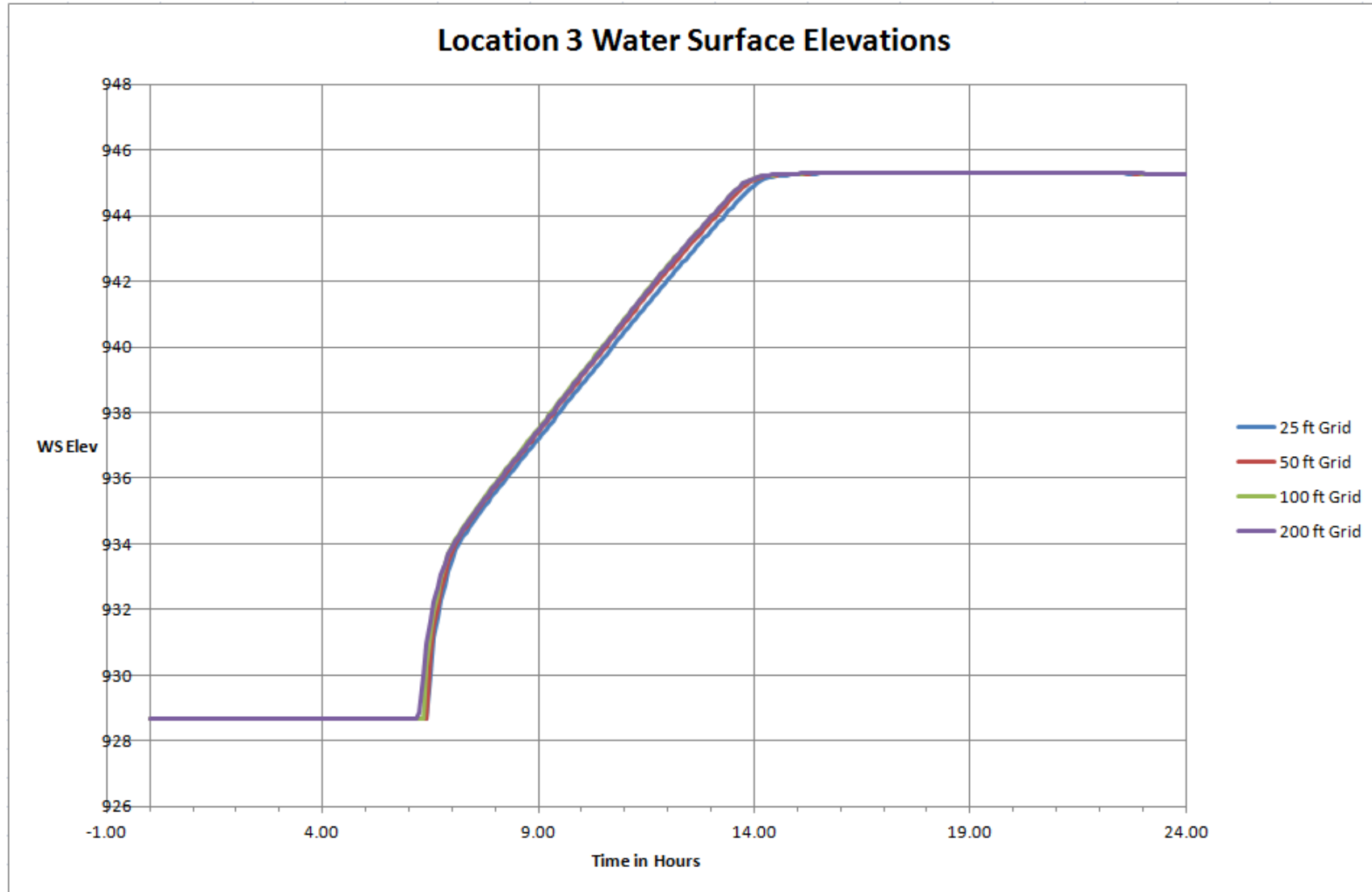


Location 2 – With Break Lines



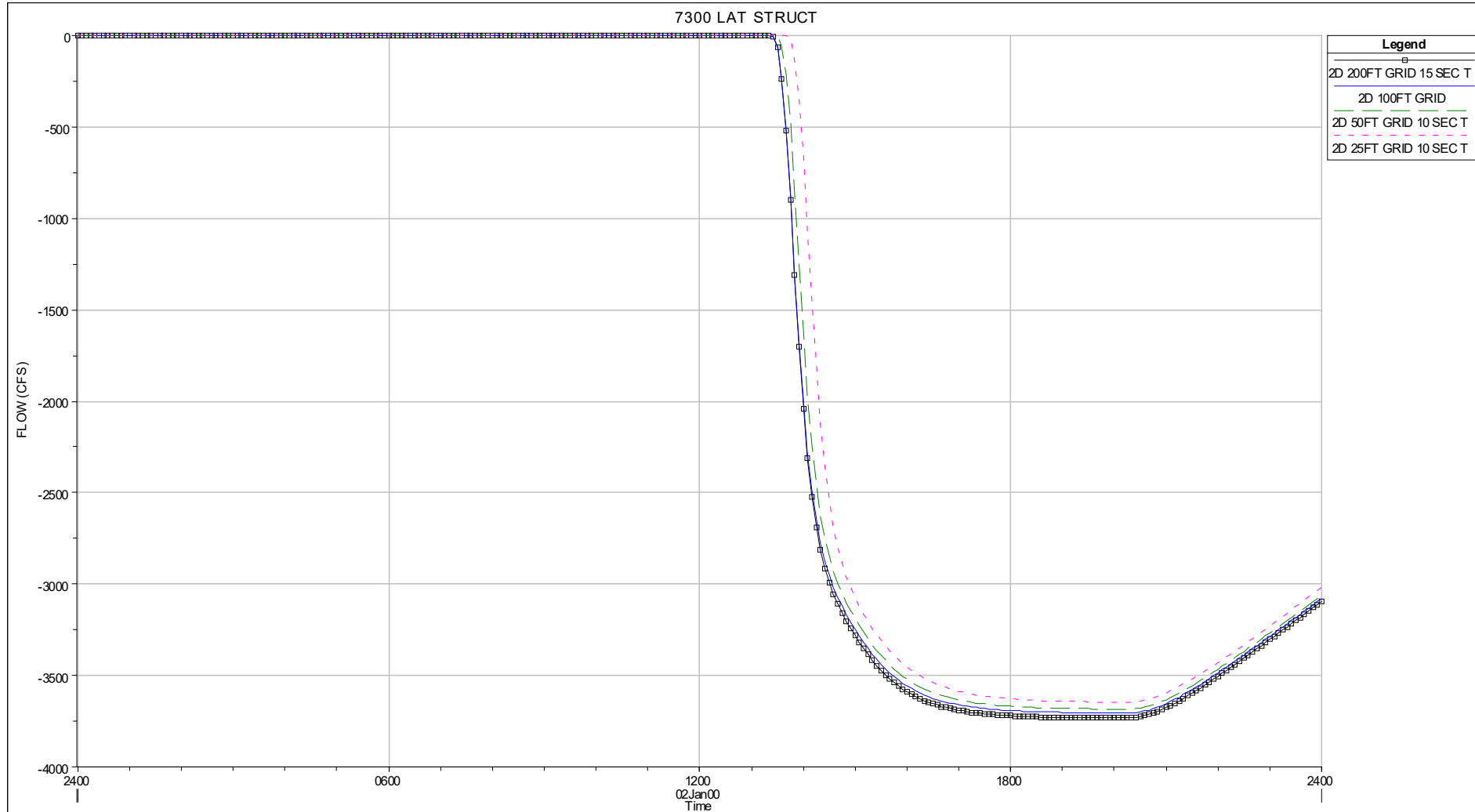


Muncie Indiana – Location 3





Muncie Lower Levee Overflow





Muncie – Computational Time

24 hr Simulation, 5 -15s Time Steps

Test No	Grid Size	No. Cells	Time Step	RAS Diff Wave	Time Step	RAS Full Eqns.
1	25ft	21719	10 sec	2 min 19s	4 sec	7 min 34s
2	50ft	5379	15 sec	33s	10 sec	1 min 16s
3	100ft	1323	15 sec	7s	15 sec	15s
4	200ft	321	20 sec	4s	15 sec	6s

Questions?